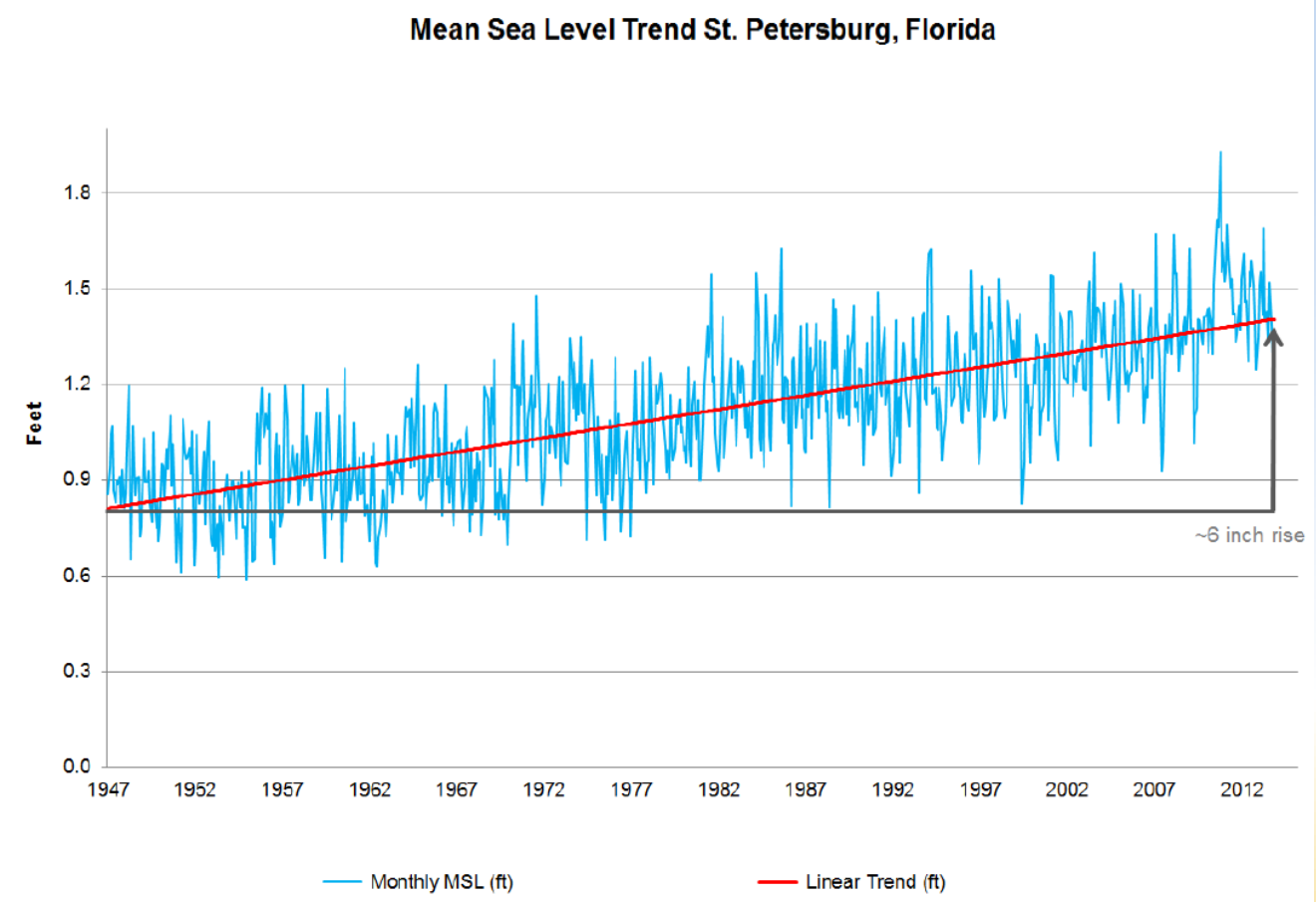
Doing Things!

Sea Level Rise (SLR) Evaluations

June 12, 2018

Why?



Mean Sea Level Trend (relative to Mean Lower Low Water) in St. Petersburg, Florida, NOAA Tide Gauge #8726520.
Source: 2015 CSAP Recommended Projection of Sea Level Rise in the Tampa Bay Region

Tampa Bay Climate Science Advisory Panel (CSAP)

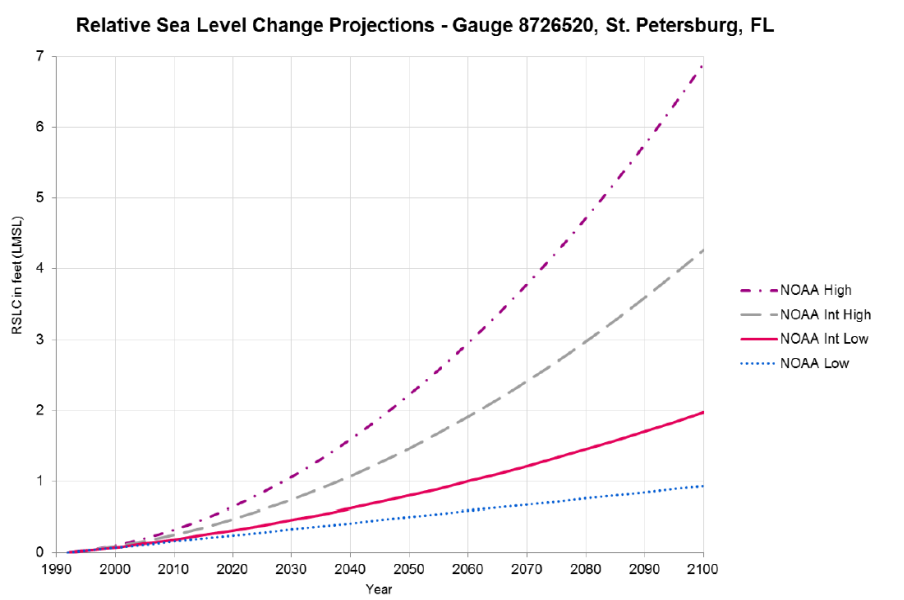
- Formed in spring 2014 – scientists & resource managers
- Tampa Bay region representation (Pinellas, Hillsborough, Manatee & Pasco)
- Three key recommendations:
  - Adaptation planning should employ a scenario-based approach that considers, at a minimum, location, time horizon, and risk tolerance.
  - Projections of SLR should be consistent with present and future National Climate Assessment estimates and methods.
  - Projections of SLR should be regionally corrected using the St. Petersburg tide gauge data.

Tampa Bay Climate Science Advisory Panel (CSAP)

Tampa Bay Climate Science Advisory Panel

Organization	Representative	Designated Alternate
UF/IFAS Extension, Florida Sea Grant	Libby Carnahan (Facilitator)	
Tampa Bay Regional Planning Council	Maya Burke	Brady Smith, AICP
Tampa Bay Estuary Program	Lindsay Cross	Ed Sherwood
Tampa Bay Water	Dr. Alison Adams, P.E.	Dr. Tirusew Asefa, P.E., D.WRE
Southwest Florida Water Management District	John Ferguson, P.G.	James Golden, AICP
Florida Climate Institute	Dr. Gary Mitchum	
US Geological Survey	Dr. Nathaniel Plant	Dr. Hilary Stockdon
NOAA National Weather Service, Tampa Bay	Dr. Charlie Paxton	
University of South Florida, School of Public Affairs	Dr. Mark Hafen	
University of South Florida, College of Marine Science	Dr. Mark Luther	Dr. Steve Meyers
NOAA Office for Coastal Management, Gulf Coast	Heidi Stiller	Kristen Laursen
Florida Sea Grant	Thomas Ruppert, Esq.	
Pinellas County	Kelli Hammer-Levy	Andy Squires
Environmental Protection Commission of Hillsborough County	Margaret Rush	Tom Ash
Manatee County	Rob Brown	
Pasco County	Melissa Charbonneau	Keith Wiley, Curtis Franklin
US Army Corps of Engineers	Glenn Landers (Technical Advisor, ex officio)	

Tampa Bay Regional Projections



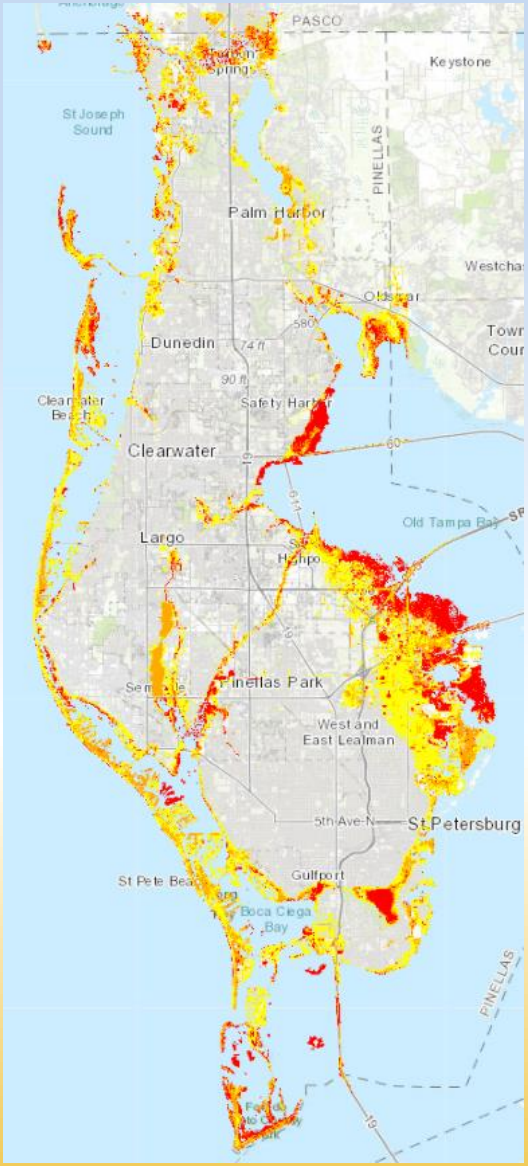
Year	NOAA Low (Feet)	NOAA Int Low (Feet)	NOAA Int High (Feet)	NOAA High (Feet)
1992[13]	0.00	0.00	0.00	0.00
2025	0.28	0.38	0.60	0.84
2035	0.37	0.53	0.90	1.31
2050	0.50	0.80	1.46	2.22
2065	0.63	1.10	2.15	3.35
2075	0.71	1.33	2.68	4.23
2100	0.93	1.97	4.26	6.89

Graphic Relative Sea Level Change (RSLC) Scenarios for St. Petersburg, Florida, as calculated using the NOAA projections and regional corrections.

Source: 2015 CSAP Recommended Projection of Sea Level Rise in the Tampa Bay Region

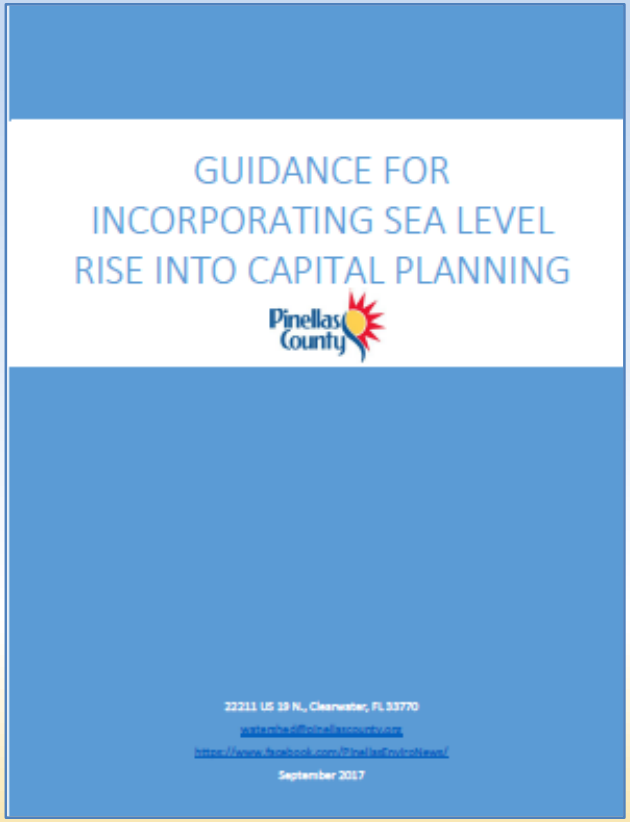
Bridge Projects Evaluation

- CSAP recommended projections
- Bridges and adjacent land use impacts
- 1 - 6 feet of SLR evaluated
- Impacts graphically depicted compared to each options' useful life



Guidance for Incorporating SLR into Capital Projects

- SLR Tool:
  - Vulnerability Assessment
    - Exposure
    - Sensitivity
    - Adaptive capacity
  - Risk Assessment
    - Anticipated level of damage
    - Service disruption
    - Cost to repair/replace for public health and safety
  - Adaptive Strategies



Doing Things!

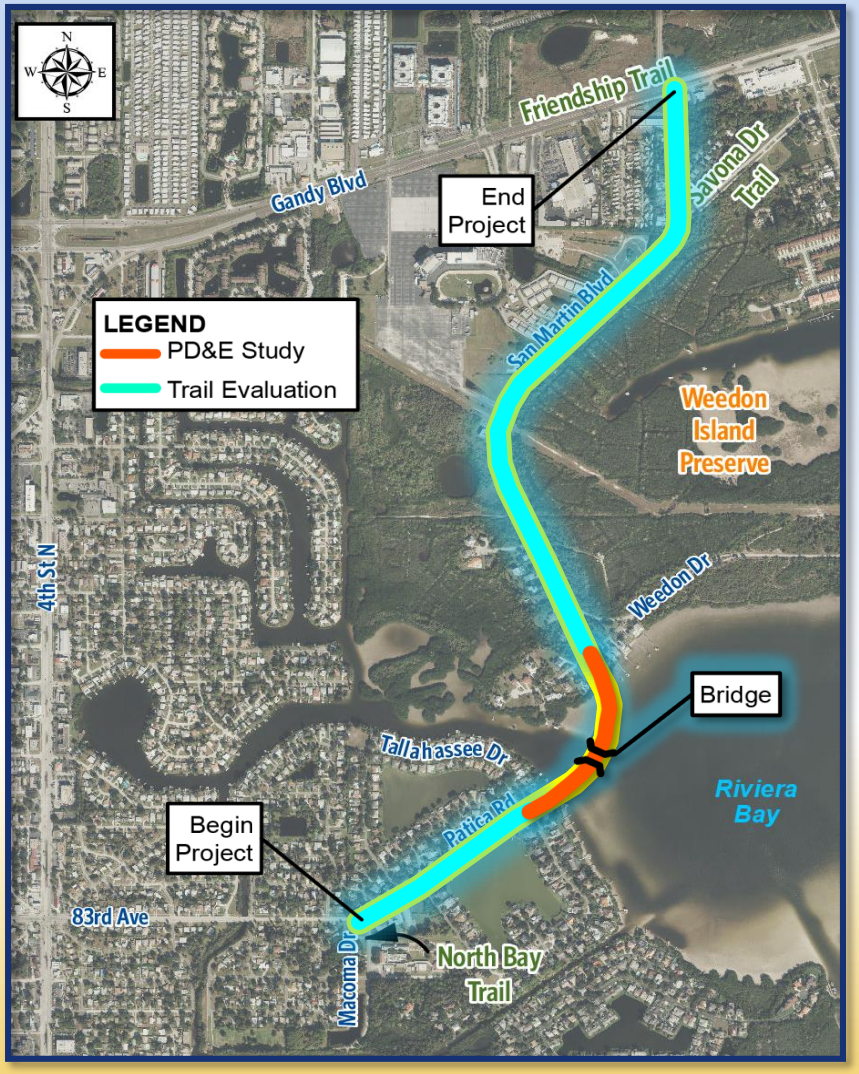
San Martin Boulevard over Riviera Bay

Project Development & Environment (PD&E) Study – Update

PID 001036A

June 12, 2018

Project Location & Limits

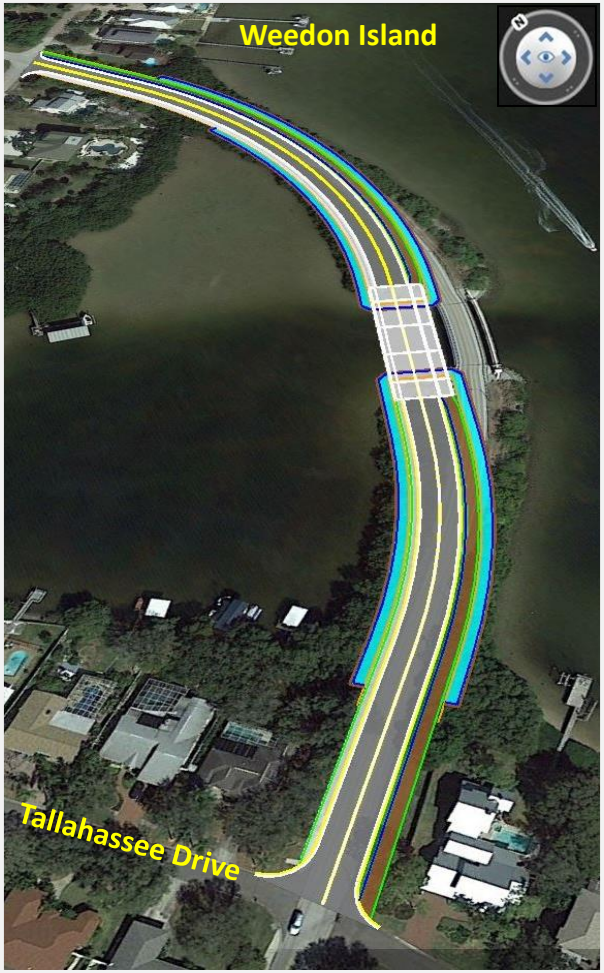


Overview Of Alternatives

No Build Alternative		
Alternatives Considered but Eliminated		
Rehabilitation / Widening Alternative	▪ Does not meet current design high water clearance elevations ▪ Existing bridge condition and unknown foundations not conducive to widening	
Alternative High-Level and Mid-Level Fixed Span Alternatives	▪ Significant impacts to surrounding environment and community ▪ Significant impacts to adjacent street networks ▪ Concerns with existing channel depth, canal width and dockage space	
Movable Bridge Alternative	▪ Significantly higher construction cost than fixed alternatives ▪ Increased long-term maintenance and operational costs	
Proposed Build Replacement Alternatives		
▪ **Left-shifted (West) Alignment** ▪ **Centered Alignment** ▪ **Right-shifted (East) Alignment**	**Highest Feasible Profile Reconstruction Alternatives (Fixed Bridge)**	▪ Improves navigational clearances ▪ Eliminates impacts to adjacent neighborhoods

Build Replacement Alternatives

WEST ALIGNMENT

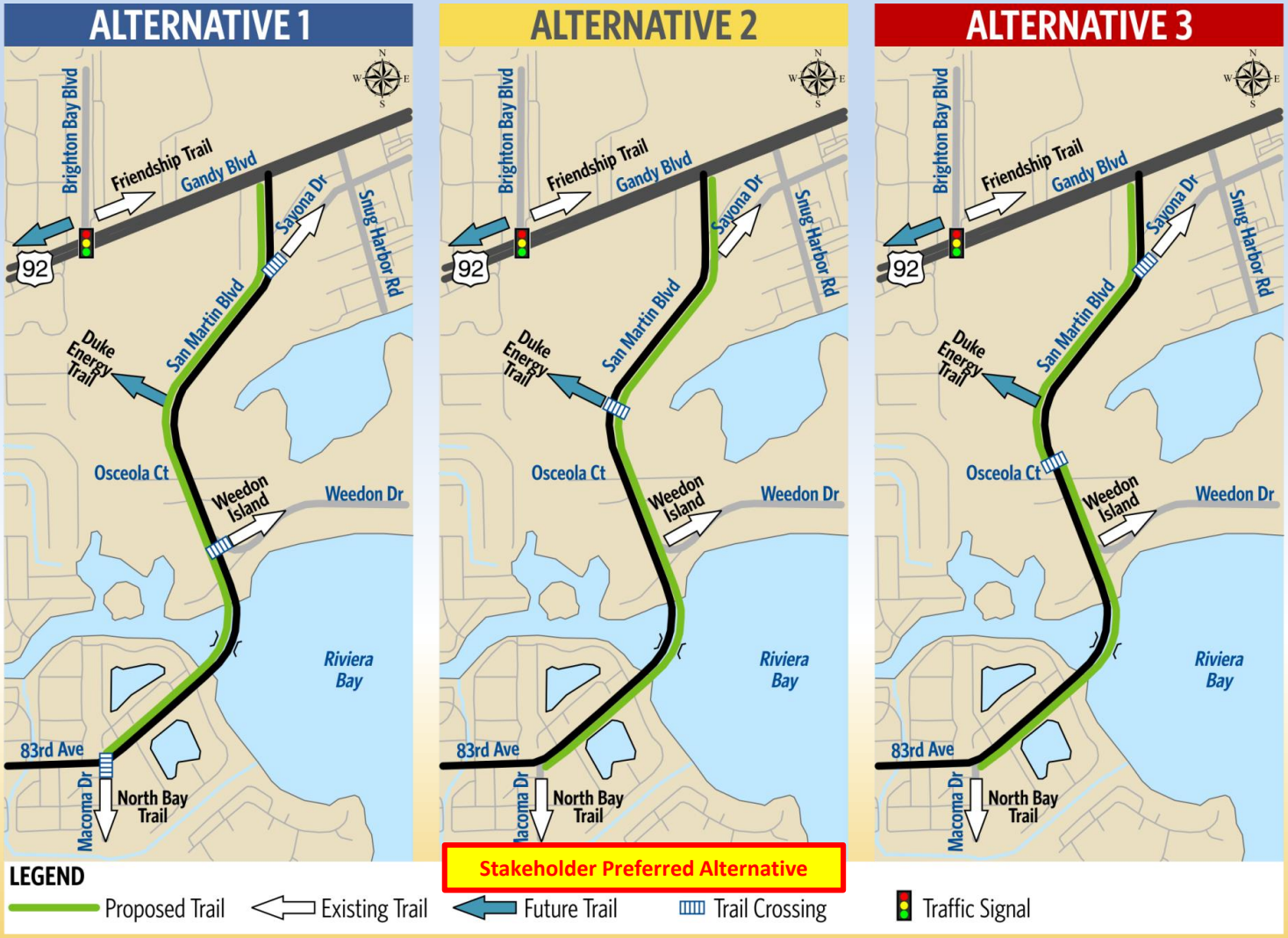


CENTER ALIGNMENT

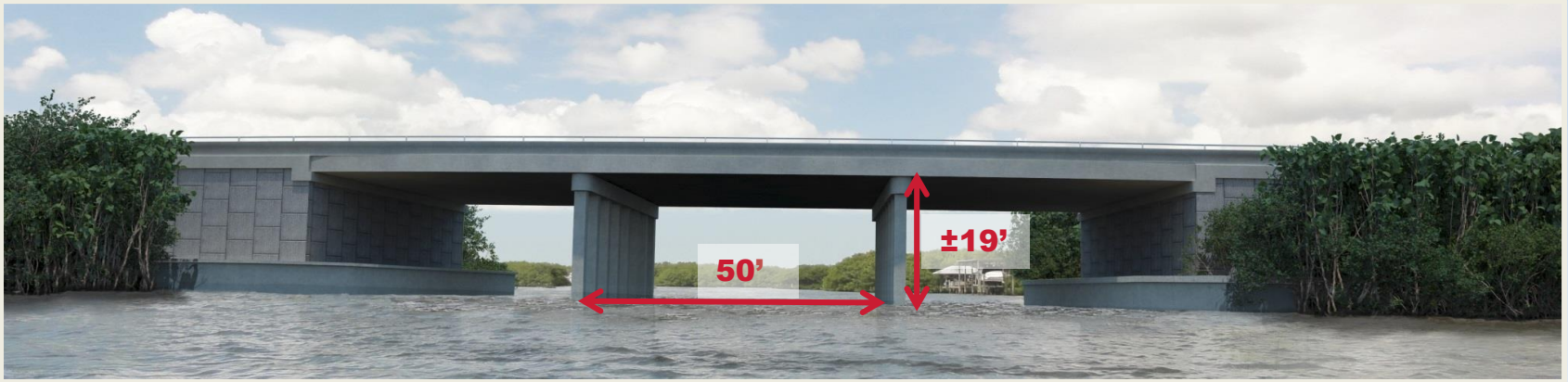
EAST ALIGNMENT

Stakeholder Preferred Alternative

North Bay Trail Extension Evaluation



Alternatives Comparison Matrix



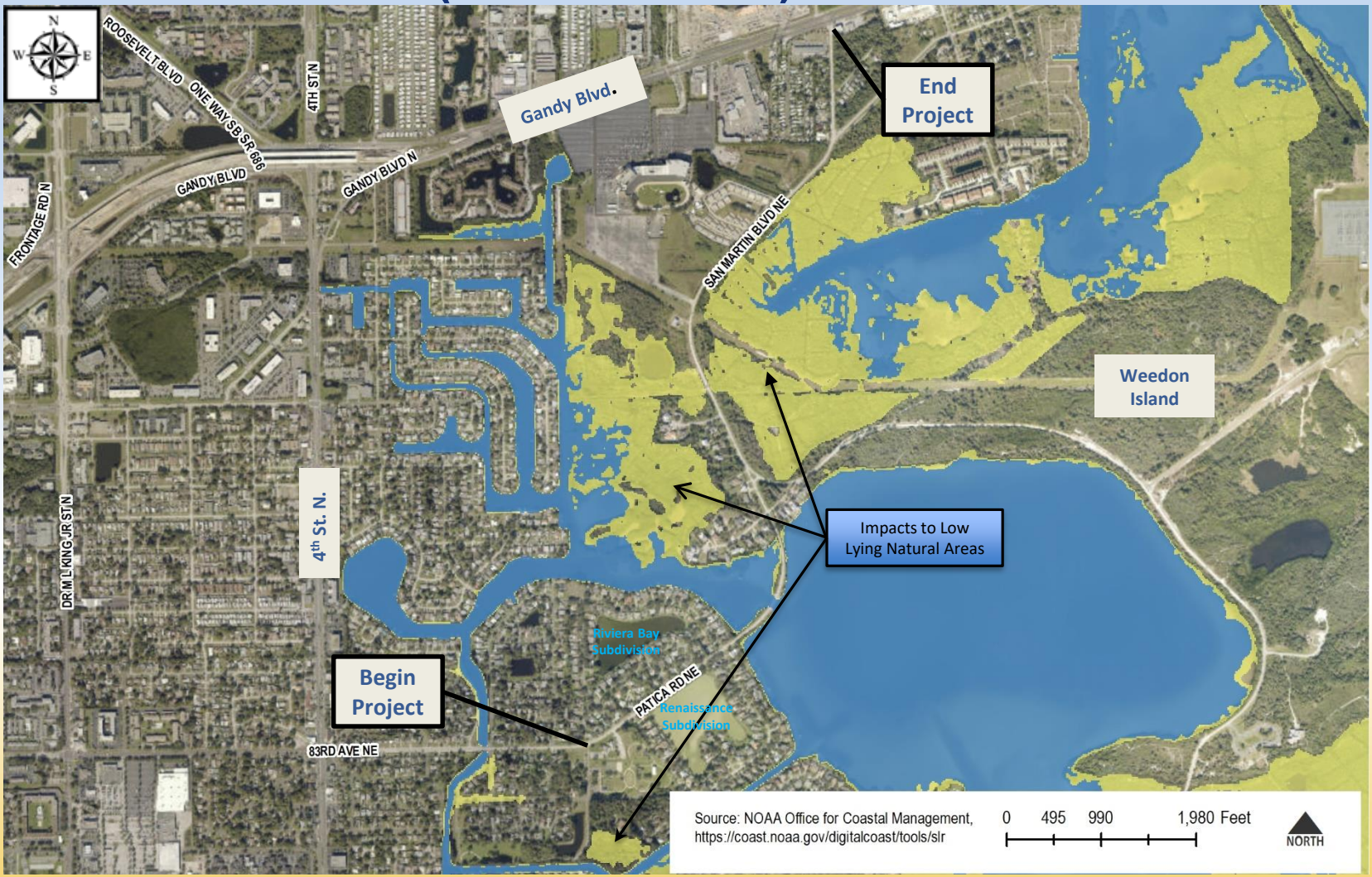
Alternative	Cost	Service Life
No-Build / Rehabilitation	NR*	N/A
West Alignment	$12.290 M	75 years
Center Alignment	$11.373 M	75 years
East Alignment	$13.753 M	75 years

Stakeholder Preferred Alternative

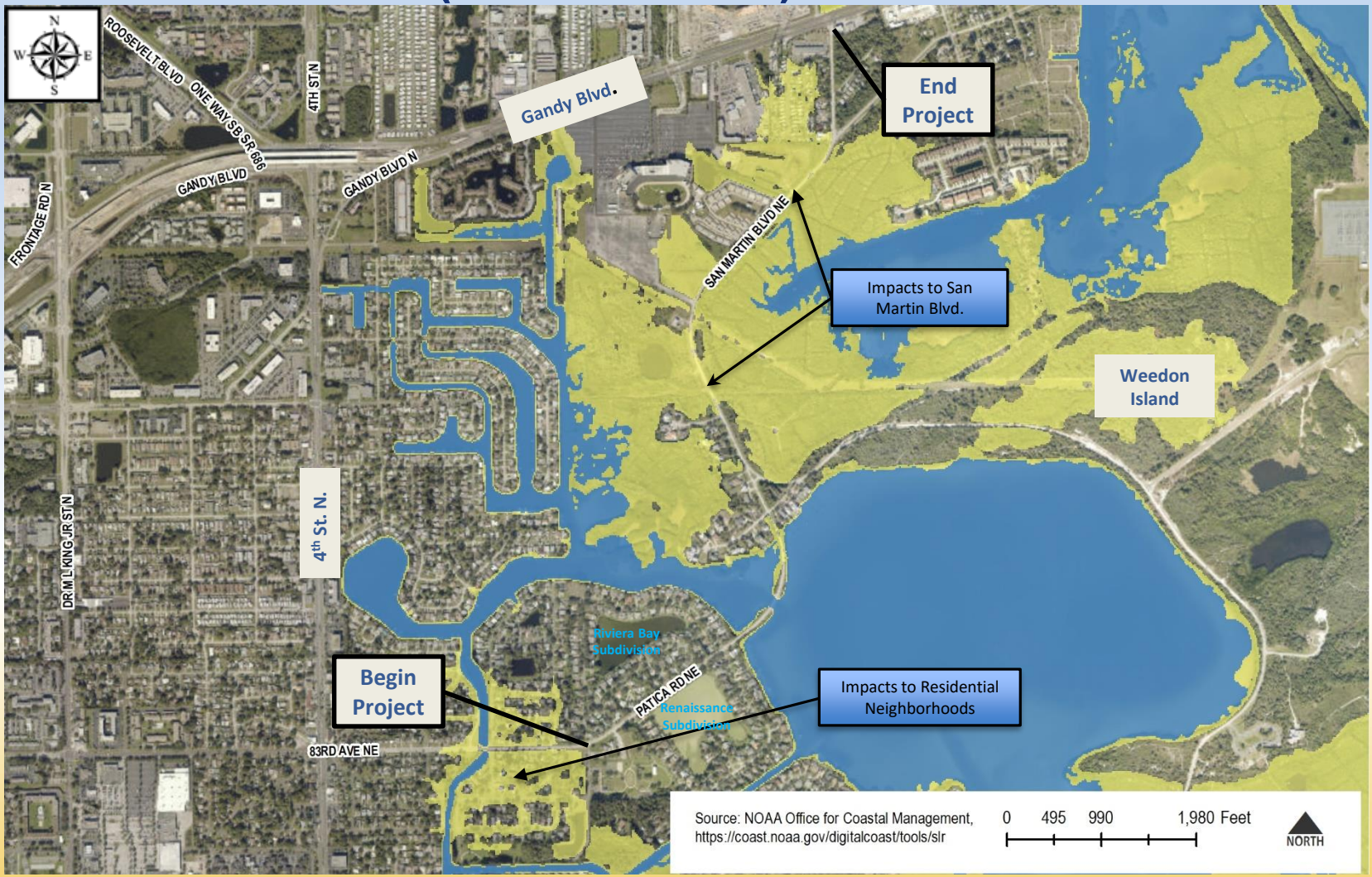
* Not recommended due to unknown foundations and existing bridge condition.

Sea Level Rise
Base Conditions (0' Inundation)

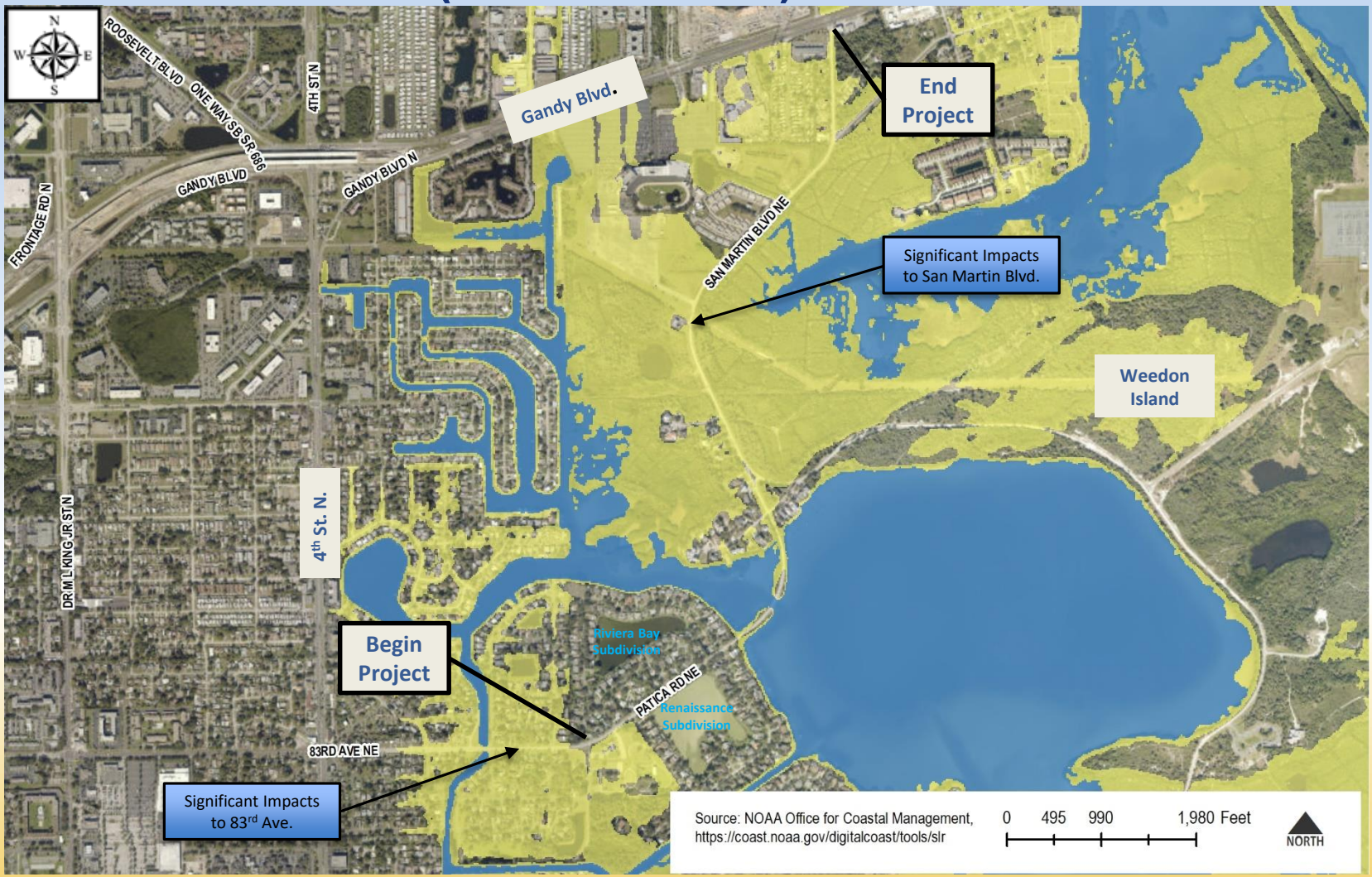
Sea Level Rise
Base Conditions (1' Inundation)



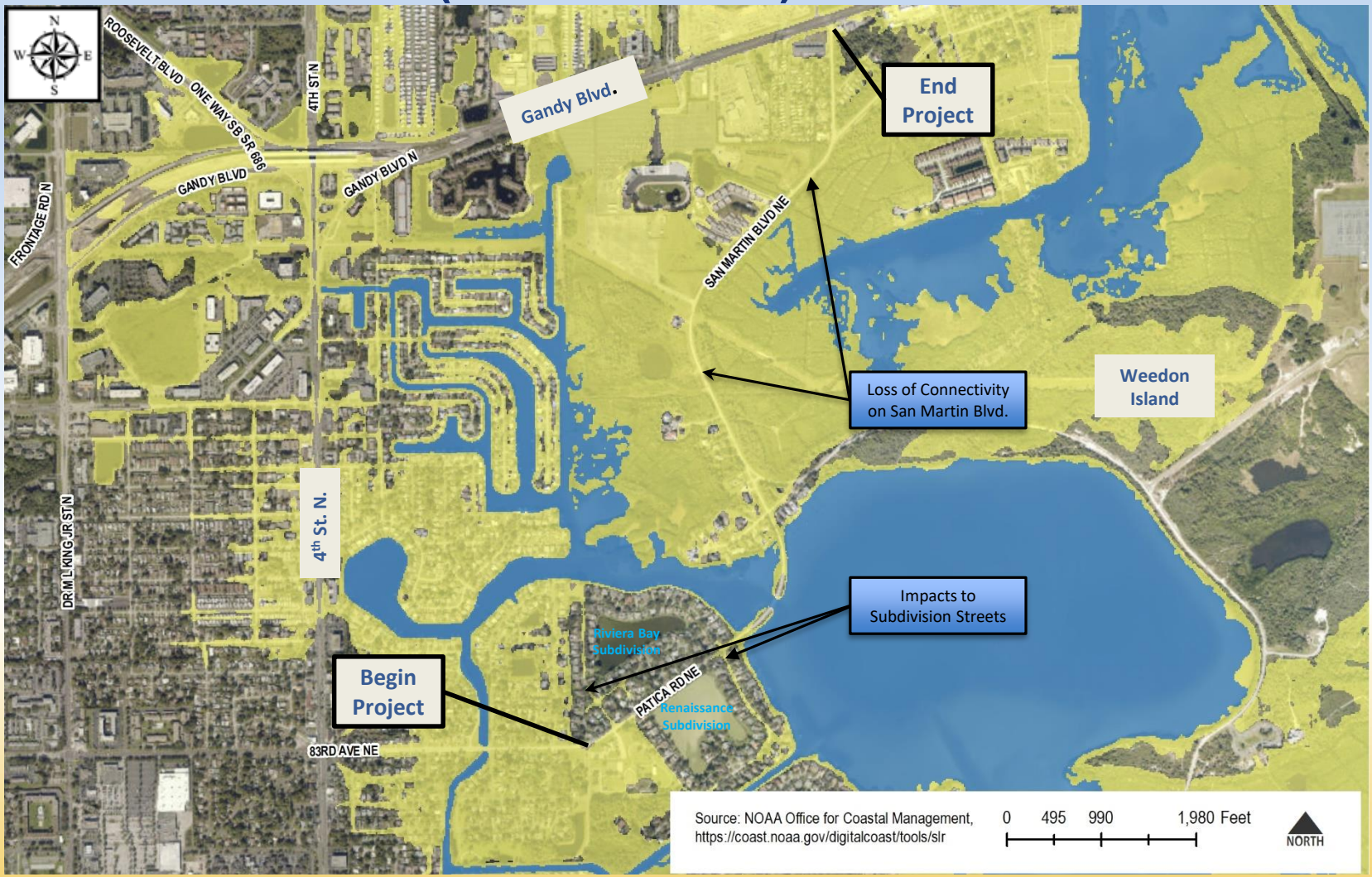
Sea Level Rise
Base Conditions (2' Inundation)



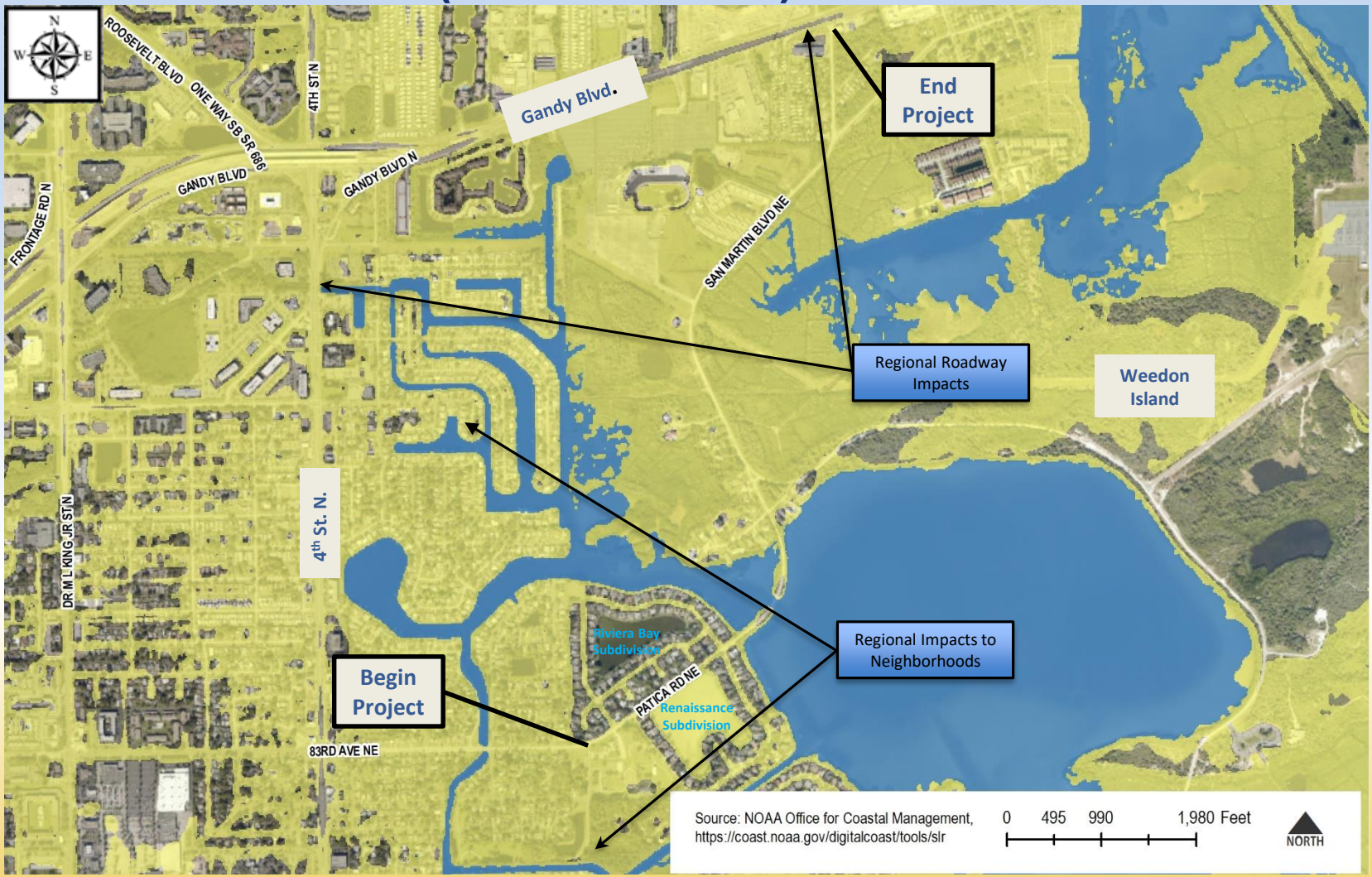
Sea Level Rise
Base Conditions (3' Inundation)



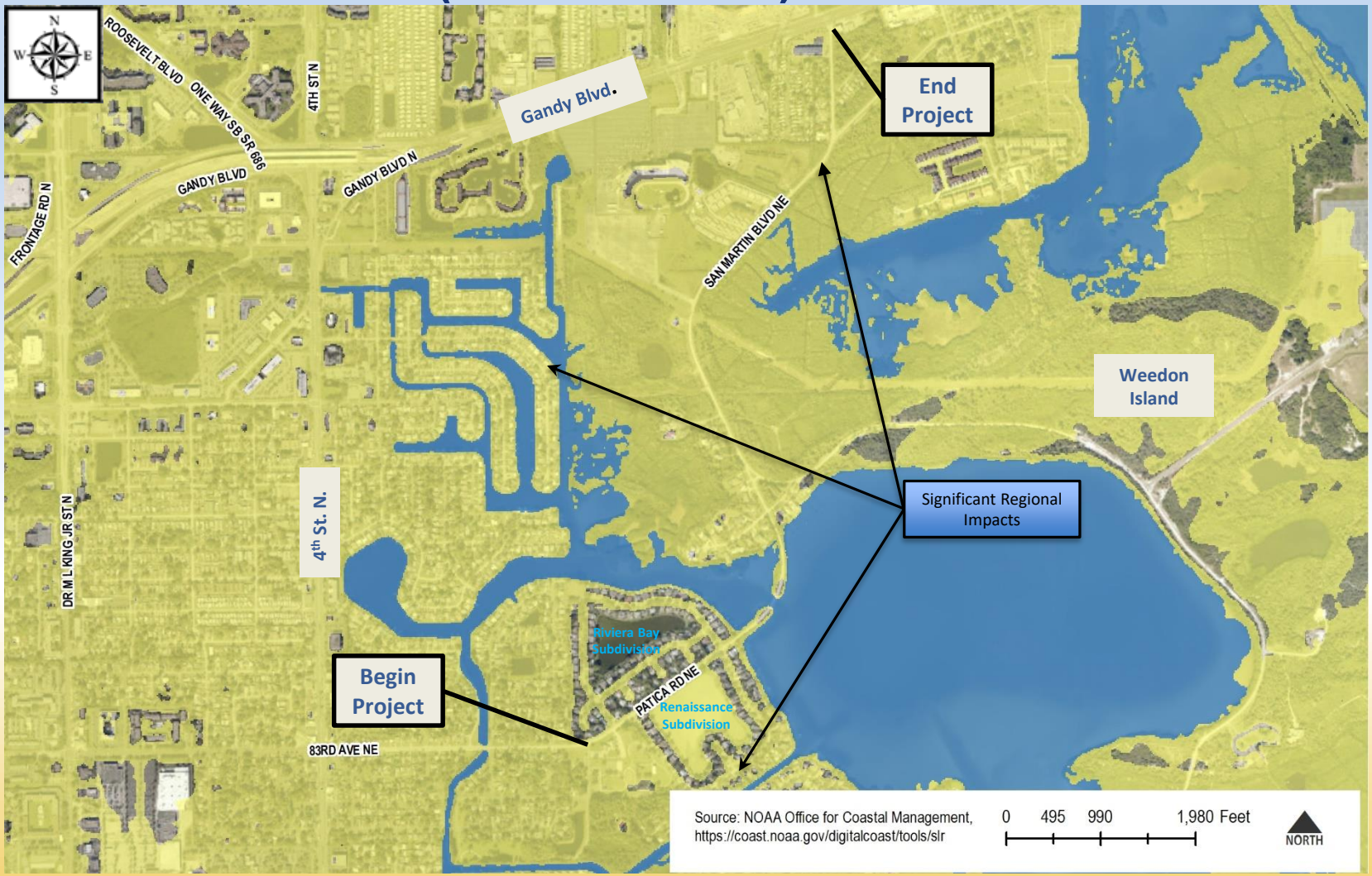
Sea Level Rise
Base Conditions (4' Inundation)



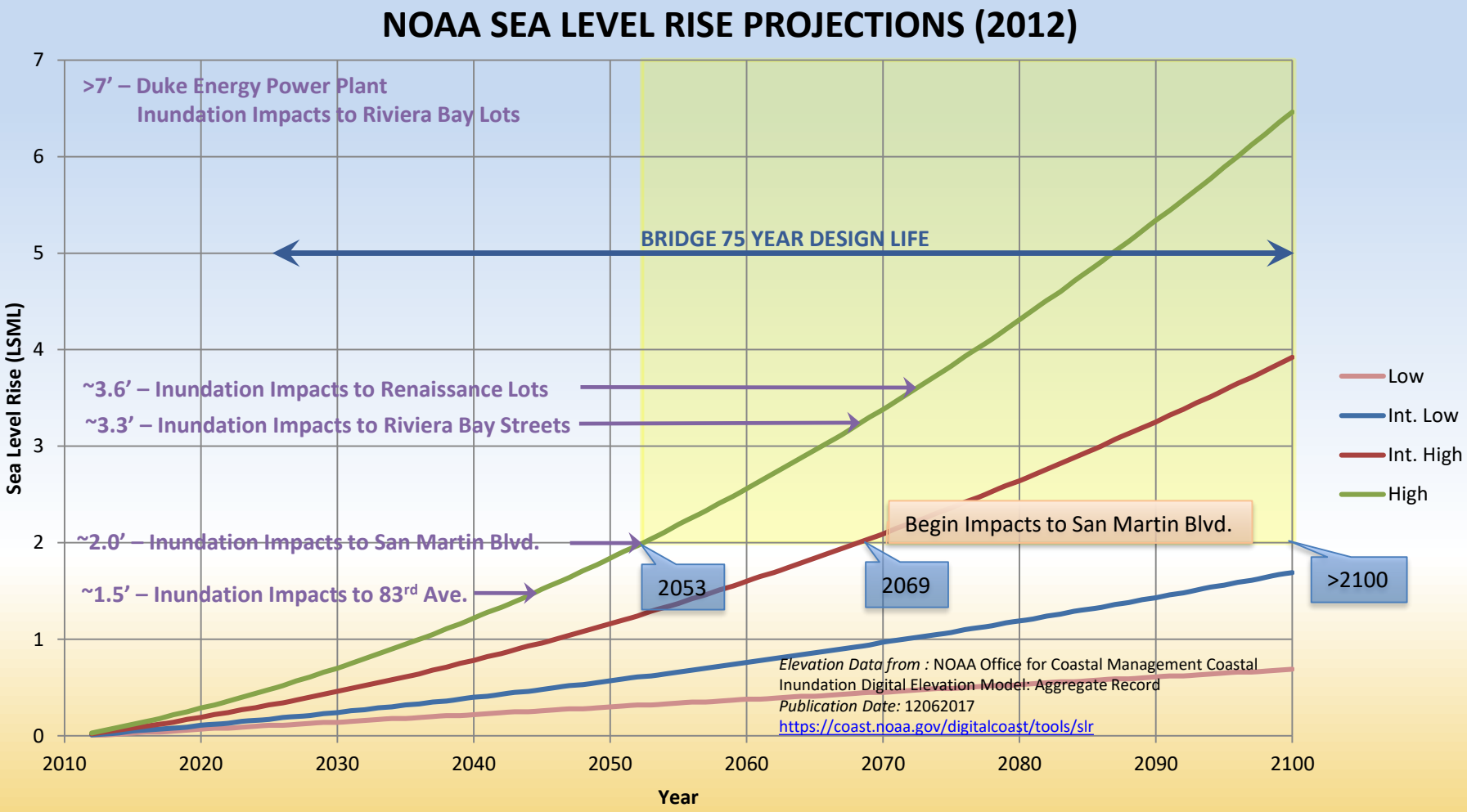
Sea Level Rise
Base Conditions (5' Inundation)



Sea Level Rise
Base Conditions (6' Inundation)



Sea Level Rise Projections Summary



Current Project Status

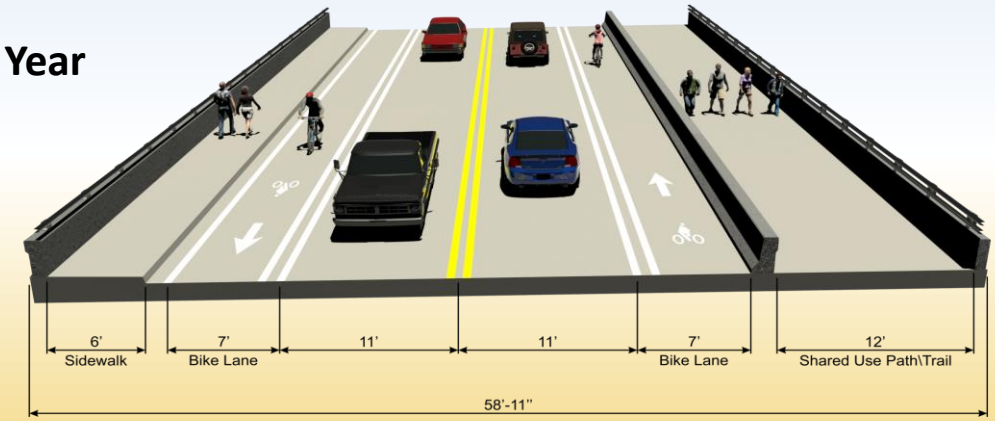
- **Construction Schedule**
  - Construction funding proposed in Penny IV
- **Stakeholder Preferred Alternatives:**
  - **Eastern Bridge Alignment**
  - **Eastern Trail Alignment**
- Stakeholder SLR Presentation held on March 29, 2018

Moving Forward

1. **No Build:**
   - A. Continue to monitor until structurally deficient
   - B. Potentially install scour countermeasures
   - C. No trail connectivity to Pinellas Trail South Loop and North Bay Trail
2. **Rehabilitation (Not Recommended):**
   - A. Does not meet current design high water clearance elevations
   - B. Existing bridge condition and unknown foundations not conducive to widening
3. **Replacement:**

   Eastern Bridge Alignment: $13.753M=75 Year

Eastern Trail Alignment: $0.921M



Doing Things!

Dunedin Causeway Bridges

Project Development & Environment (PD&E) Study – Update

June 12, 2018

Project Location and Limits

Bridge Options

- **No-Build: $4+M = 13 Years**

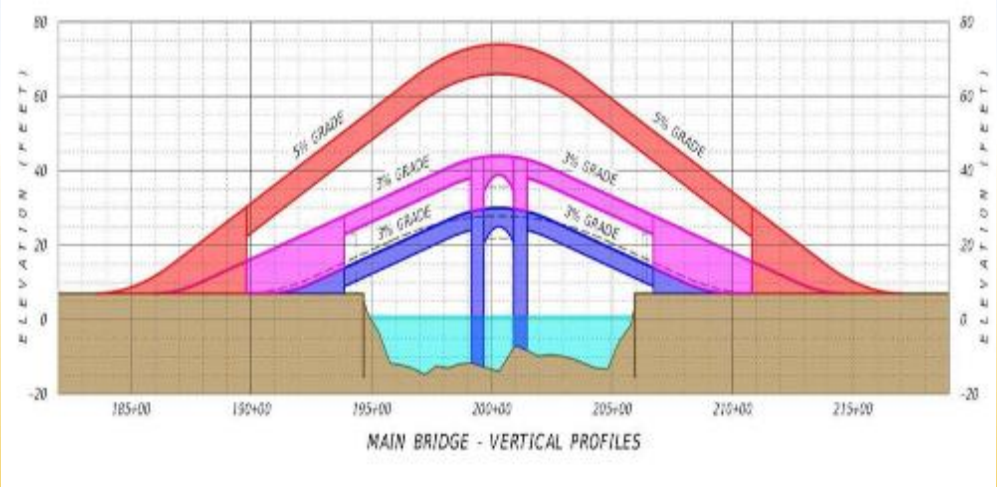
  Cost includes countermeasures for both bridges

- **Major Rehabilitation: $31+M = 25 Years**
  - Additional Service Life: 25 years (to 2045)
  - Not presented to public as a viable alternative
    - Does not meet transportation/recreational needs of the community
    - Does not address the functionally obsolete bridge geometry

  Cost includes $25.1 million for main bascule bridge and $6.2 million for the tide relief bridge

- **Replacement = 75 Years**
  - Main Bridge
    - High-Level Fixed = $60+M
    - Mid-Level Movable = $81+M
    - Low-Level Movable = $77+M

  Costs include replacement of the tide relief bridge



Alternatives Cost/Service Life

Alternative	Cost	Annual O&M	Service Life
No-Build	$4.0 M*	$303 K	13 years
Rehabilitation	$31.3 M**	$228 K	25 years
Replacement (Low Level Movable)	$77.0 M***	$230 K	75 years
Replacement (Mid-level Movable)	$81.2 M***	$231 K	75 years
Replacement (Fixed)	$60.0 M***	$9.3 K	75 years

*Cost includes $4.0 million in scour countermeasures for both bridges.

** Cost includes $25.1 million for rehabilitation of Main Bascule bridge and $6.2 million for rehabilitation of the Tide Relief bridge.

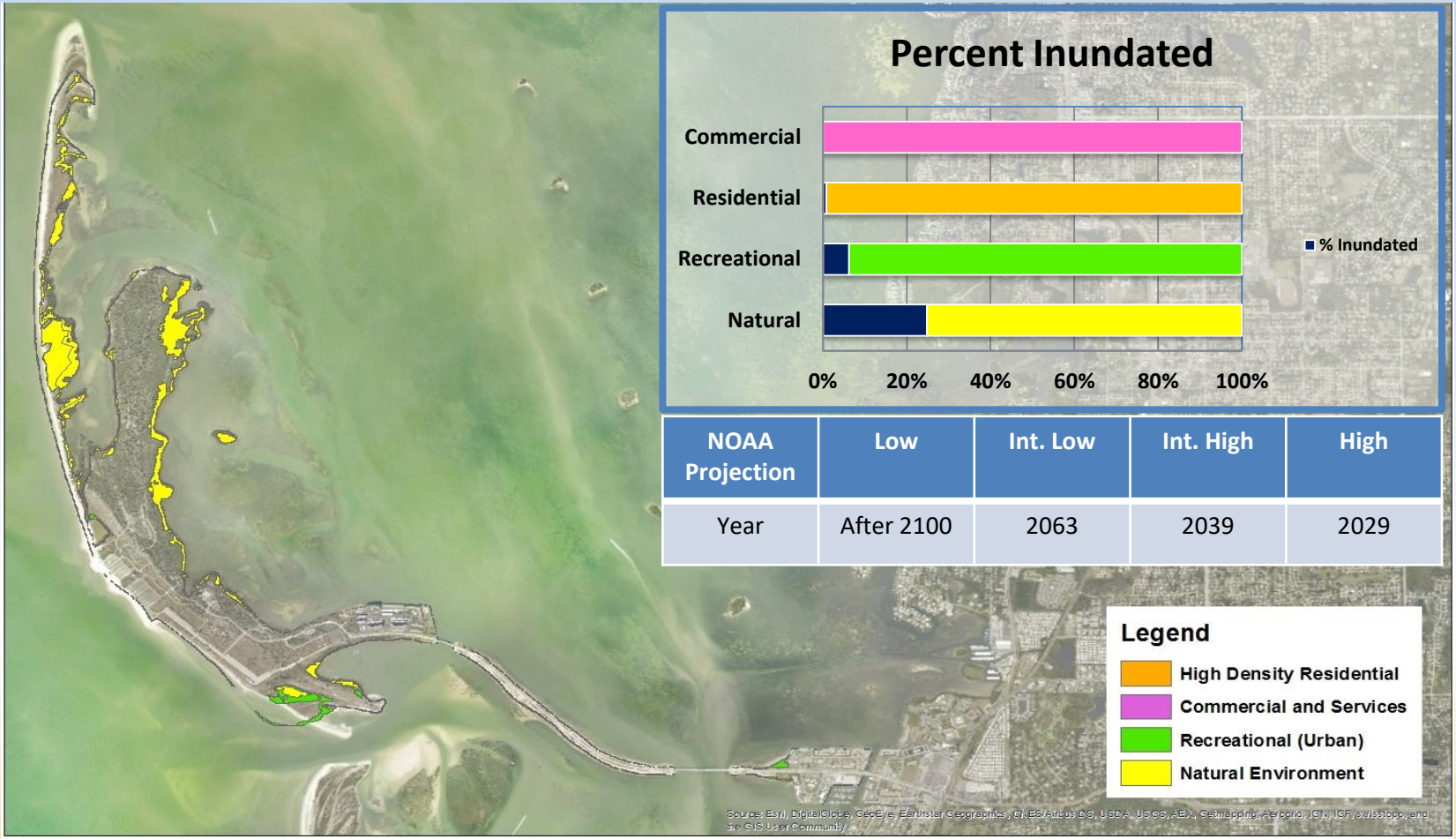
***Cost includes $9.3 million for replacement of the Tide Relief bridge.

Land Use

- **Residential**: 792 Dwelling Units
- **Commercial**: 11 Businesses (Ward Island)
- **Recreational/Natural**: 1.5M Visitors Annually ($113M economic impact)
  - Attracts a variety of enthusiasts such as: kayakers, bird-watchers, beachgoers, hikers, fishermen, etc.

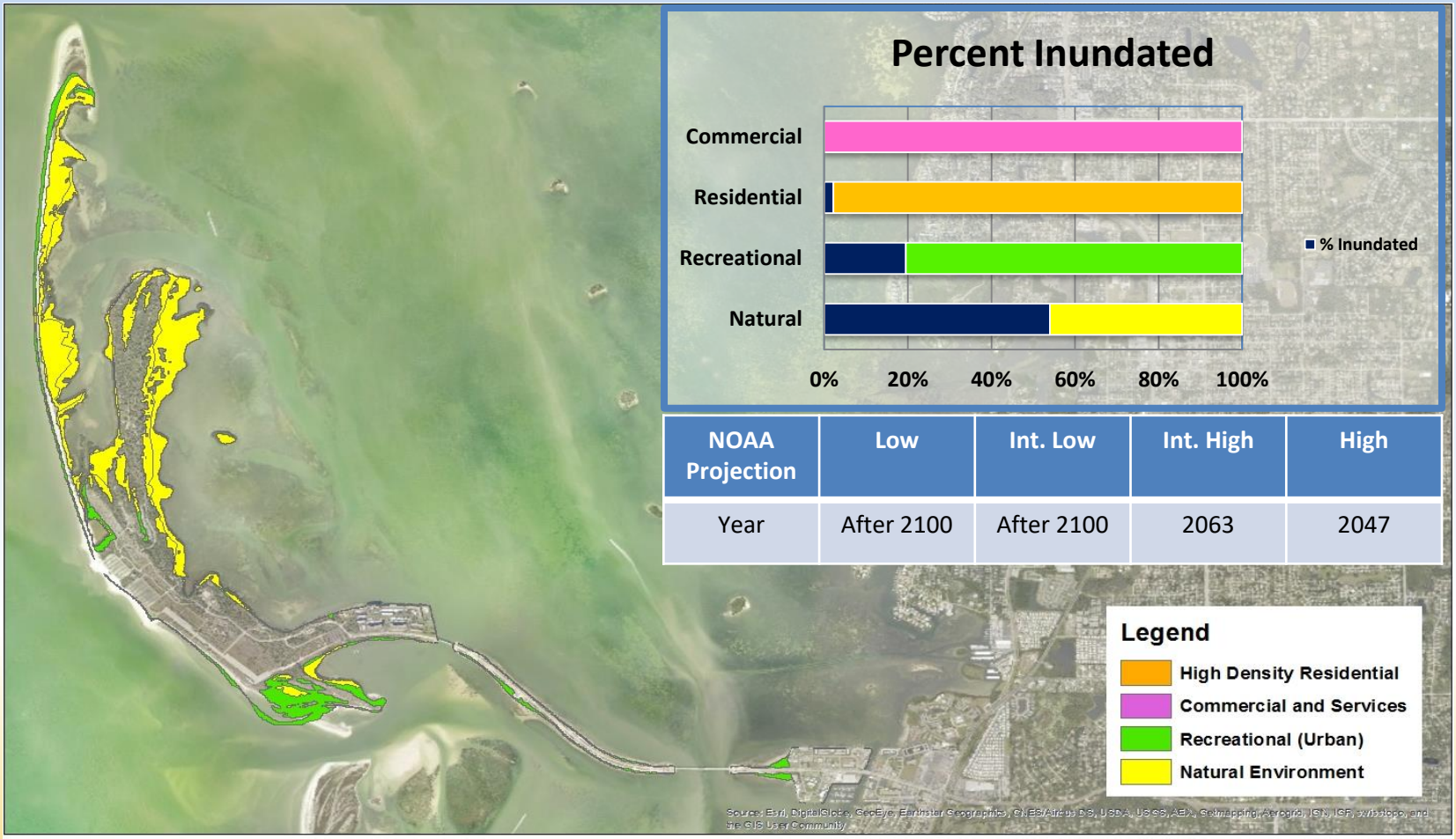
Existing Conditions

Land Use Impact: 1 Foot SLR



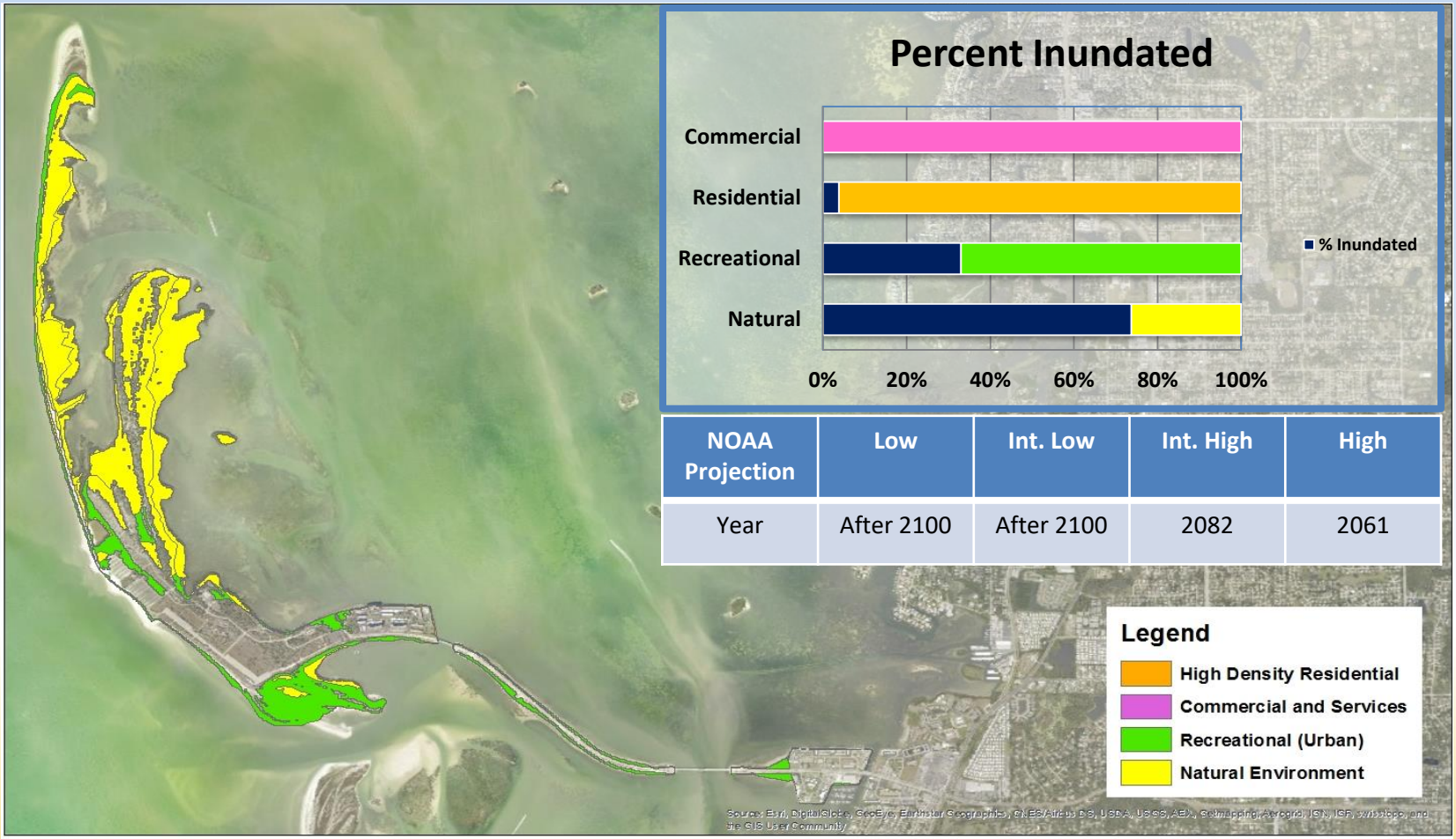
NOAA Projection	Low	Int. Low	Int. High	High
Year	After 2100	2063	2039	2029

Land Use Impact: 2 Feet SLR



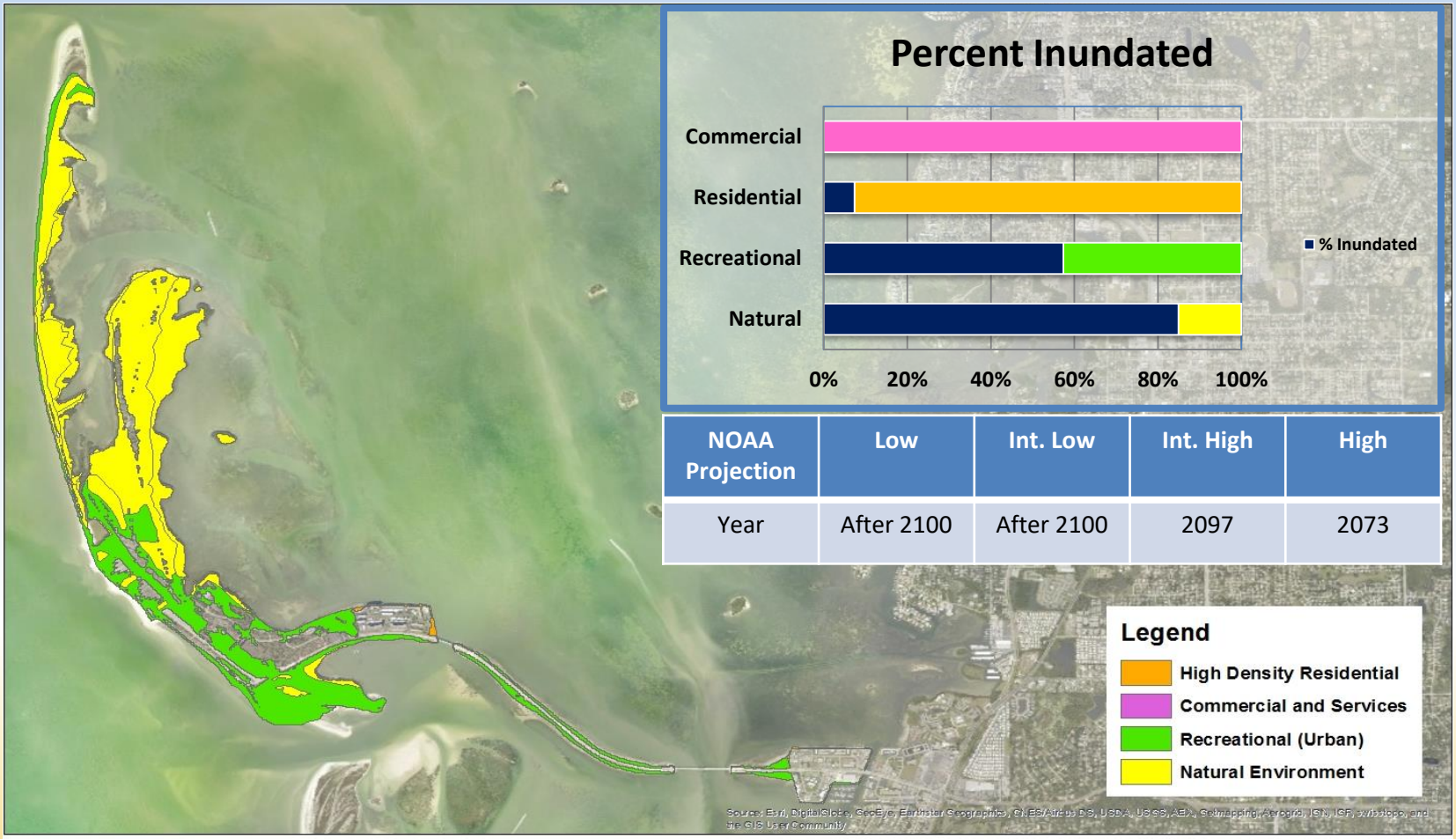
NOAA Projection	Low	Int. Low	Int. High	High
Year	After 2100	After 2100	2063	2047

Land Use Impact: 3 Feet SLR



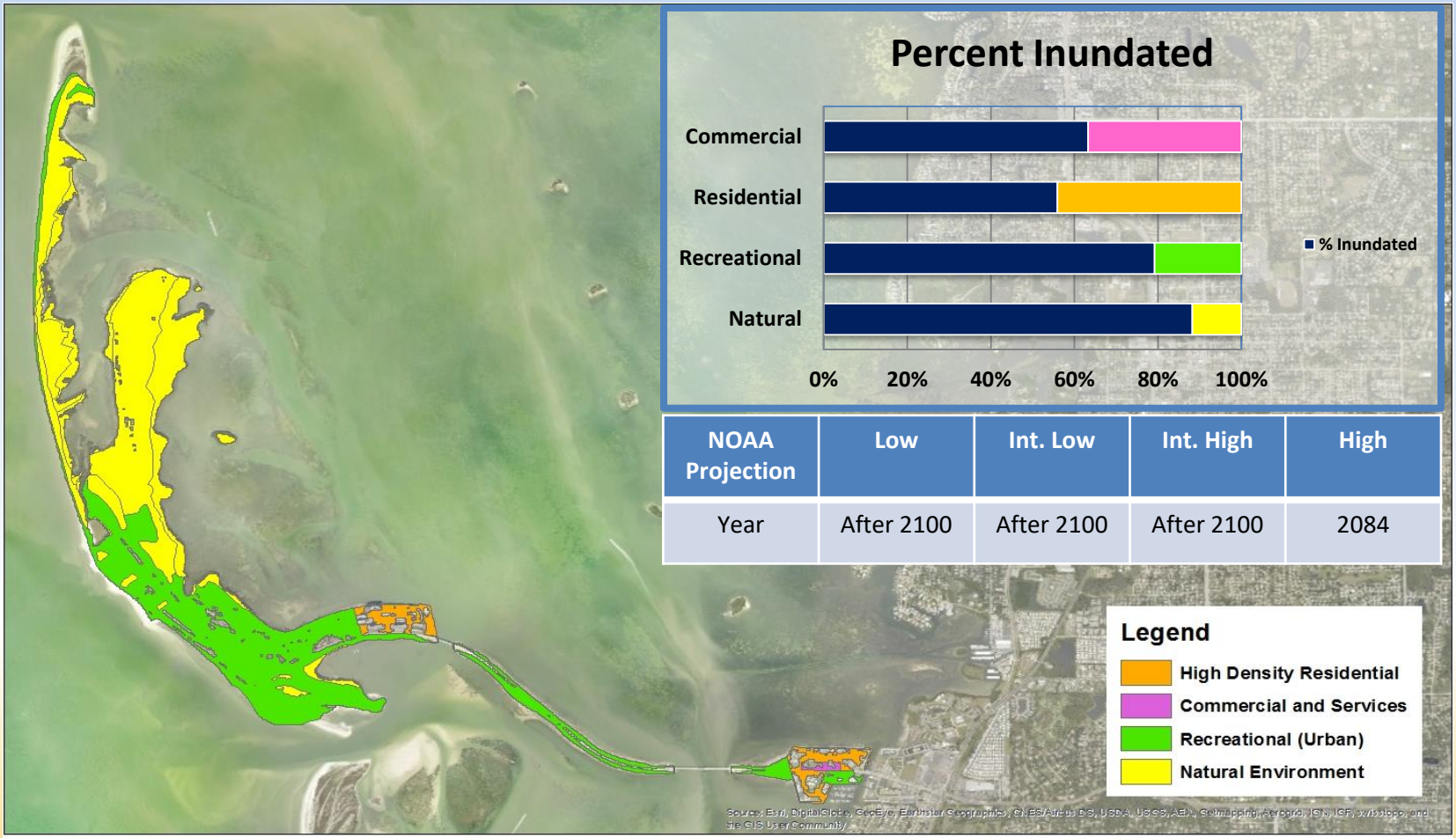
NOAA Projection	Low	Int. Low	Int. High	High
Year	After 2100	After 2100	2082	2061

Land Use Impact: 4 Feet SLR



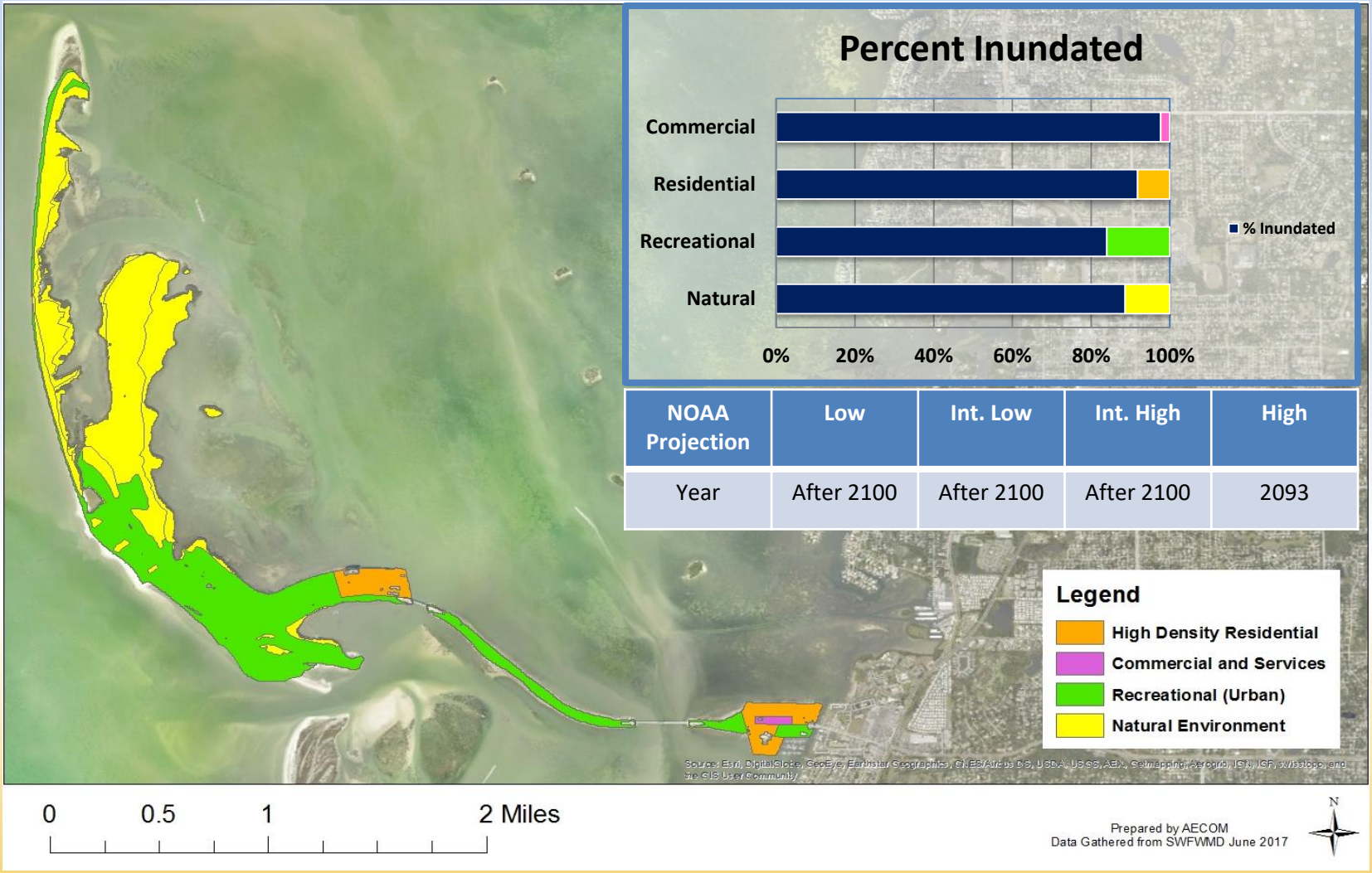
NOAA Projection	Low	Int. Low	Int. High	High
Year	After 2100	After 2100	2097	2073

Land Use Impact: 5 Feet SLR



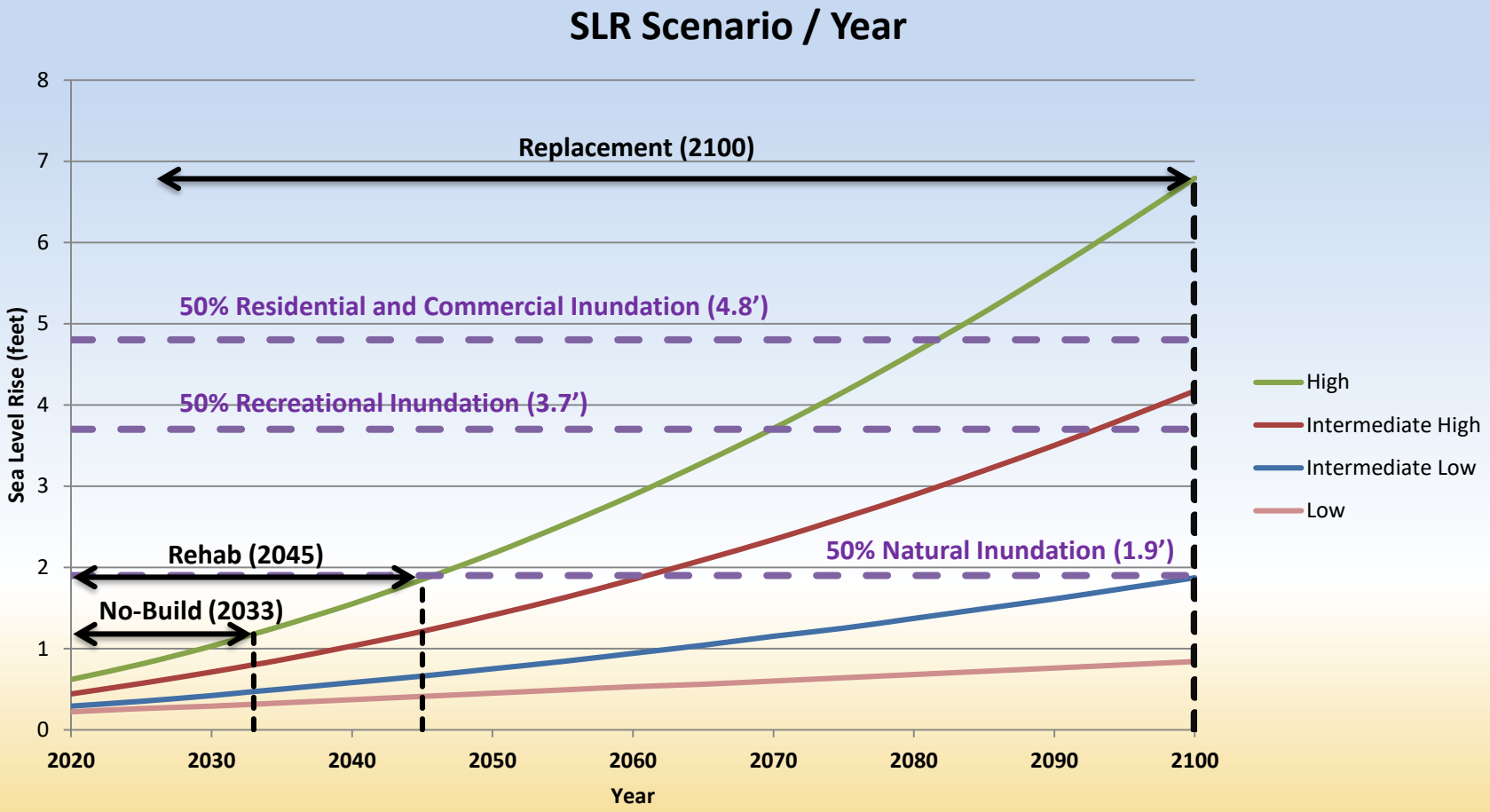
NOAA Projection	Low	Int. Low	Int. High	High
Year	After 2100	After 2100	After 2100	2084

Land Use Impact: 6 Feet SLR



NOAA Projection	Low	Int. Low	Int. High	High
Year	After 2100	After 2100	After 2100	2093

Sea Level Rise Projections Summary



Current Project Status

- **Construction Schedule:**
  - Anticipate construction funding in Penny IV
- **Stakeholder Preferred Alternatives**
  - **Mid-Level Movable Bridge Alternative**
    - Dunedin Causeway Ad Hoc Committee
    - Dunedin City Commission
    - General Public
  - **High-Level Fixed Bridge Alternative**
    - Pinellas MPO Bicycle/Pedestrian Action Committee

- Stakeholder SLR Presentation held on March 6, 2018

Moving Forward

1. No Build: $4+M = 13 Years

Cost includes countermeasures for both bridges

2. Rehab: $31+M = 25 Years

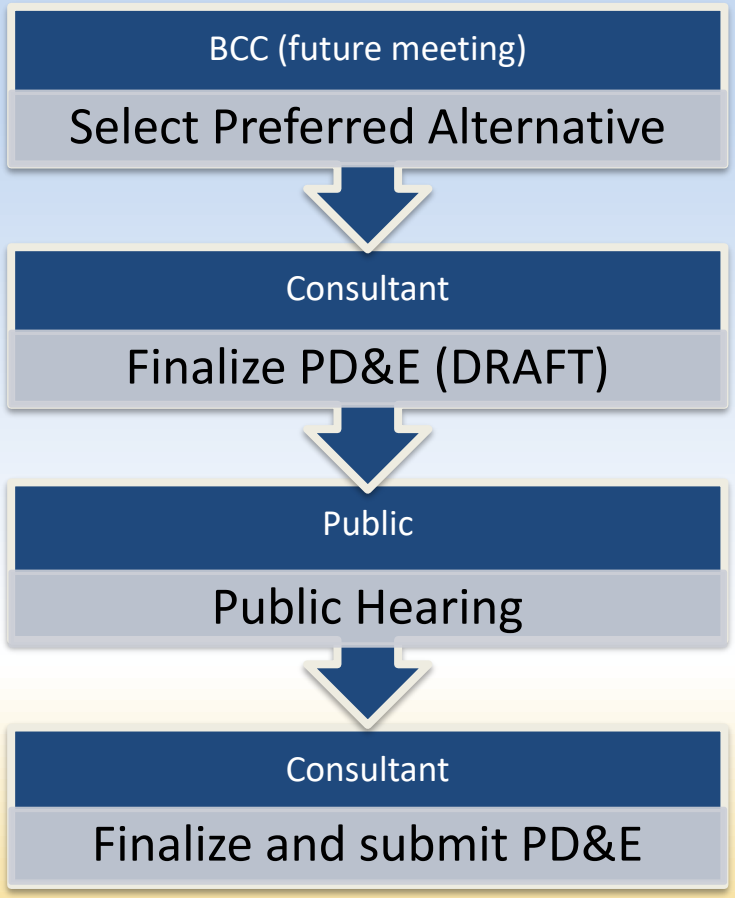
Cost includes $25.1 million for main bascule bridge and $6.2 million for the tide relief bridge

3. Replacement:

A. **Main Fixed: $60+M = 75 Years**
B. **Main Movable Mid: $81+M = 75 Years**

Costs include replacement of the tide relief bridge

Process for next steps



No funding obligation to build preferred alternative

Inform public

Approved PD&E needed to seek grants

Options to Consider

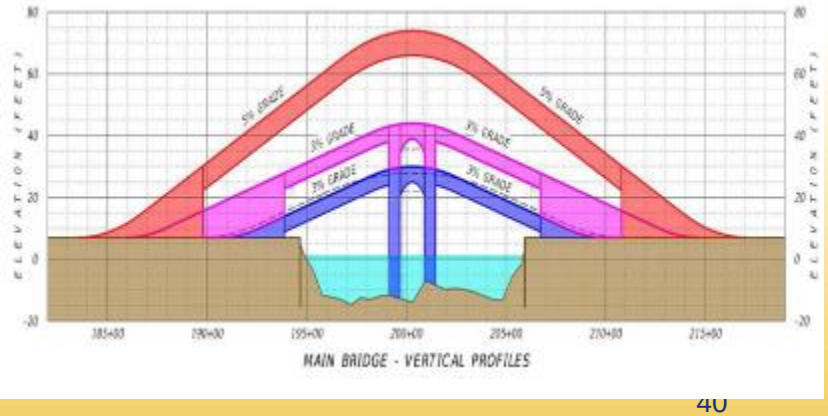
San Martin

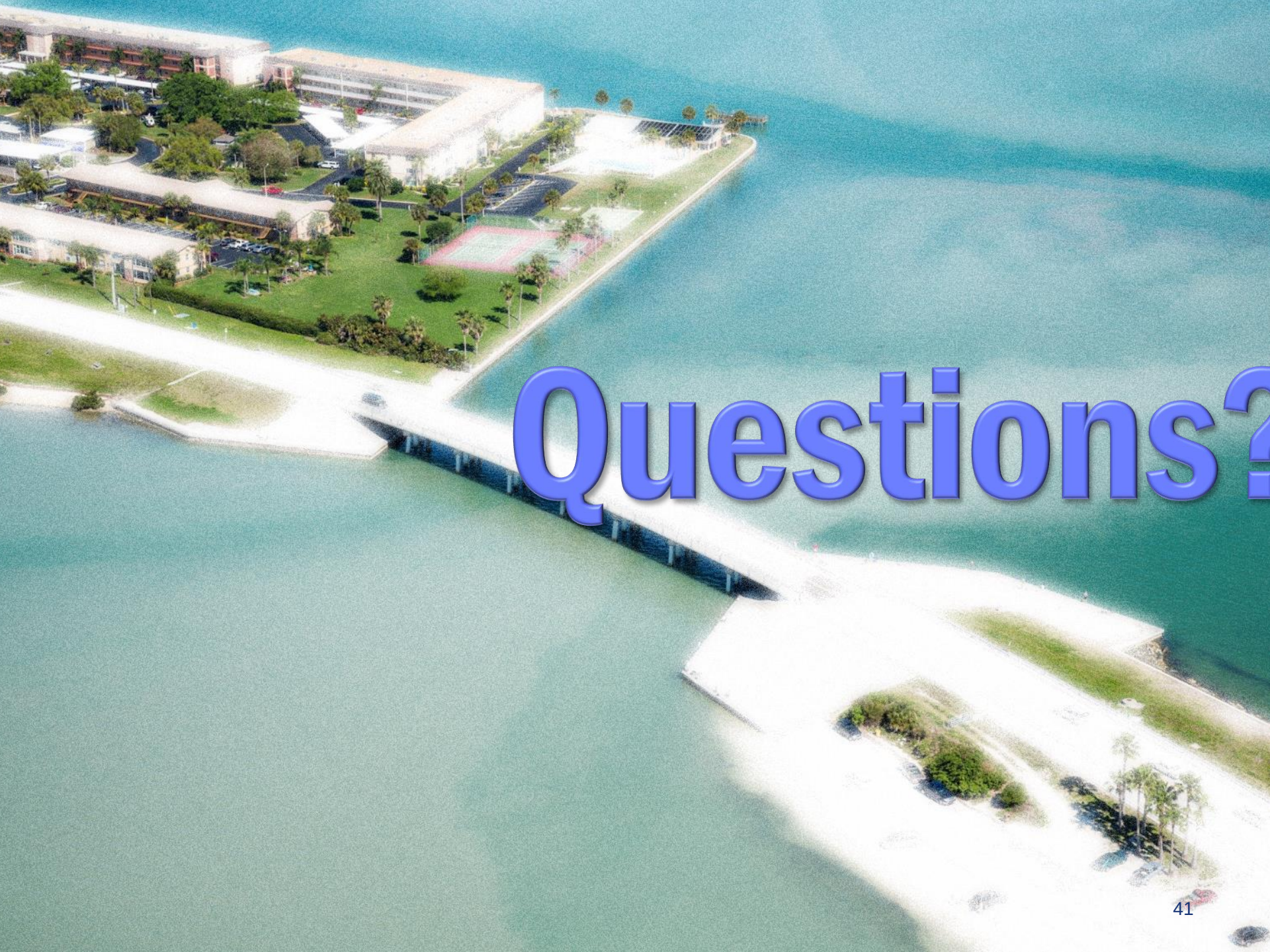
1. No Build: $ unknown
2. Rehabilitation: $ unknown
3. Replacement:
   A. Eastern Bridge Alignment: $13.75M = 75 Year

Eastern Trail Alignment: $0.921M

Dunedin Caus.

1. No Build: $4+M = 13 Years
2. Rehab: $31+M = 25 Years
3. Replacement:
   A. Main Fixed: $60+M = 75 Years
   B. Main Movable Mid: $81+M = 75 Years




Questions?